



HOUSE OF LORDS

Science and Technology Committee

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1st Report of Session 2008–09

# **Systematics and Taxonomy Follow- up: Government Response**

Report

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Ordered to be printed 17 March 2009 and published 20 March 2009

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Published by the Authority of the House of Lords

*London* : The Stationery Office Limited  
£price

HL Paper 58

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# Systematics and Taxonomy Follow-up: Government Response

## THE COMMITTEE'S COMMENTARY ON THE GOVERNMENT RESPONSE

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1. In August 2008, the Committee published its report *Systematics and Taxonomy: Follow-up*,<sup>1</sup> following two previous inquiries in 1992 and 2002.<sup>2</sup> The Government response to our follow-up report, which we received in early November 2008, is published in Appendix 1 to this report.
2. There are elements of the Government response which we welcome—for example: the decision to provide a financial contribution in 2008–09 towards the costs of assimilating the CAB International fungal reference collection at the Royal Botanic Gardens, Kew (recommendation 7.21); the commissioning by the Natural Environment Research Council (NERC) of a study to ascertain the current number of taxonomists in the UK (recommendation 7.4); the agreement to develop a roadmap for delivery of Internet-based taxonomy, funded by the Biotechnology and Biological Sciences Research Council and NERC (recommendation 7.12); and the commitment of NERC, with the Natural History Museum, to continue to facilitate dialogue between those with interests in taxonomic issues (recommendation 7.5).
3. The Government response, however, also gave us cause for concern. As a result, in December 2008, we wrote to Mr Ian Pearson MP, Minister of State for Science and Innovation at the Department for Innovation, Universities and Skills (DIUS), and requested the following:
  - Further reasons for the Government's refusal to accept the recommendation that DIUS should be the lead department for systematic biology.
  - An explanation as to why the Scottish Government had not been consulted by DIUS when drawing up its original response.
  - More information about the governance of science within DIUS generally.
  - Further reaction to the Committee's criticism of NERC that it had given out mixed signals about the whether it was prepared to fund classical taxonomy.
4. In February 2009, the Government responded to our request for further information. Our letter and the Government's reply are printed in Appendices 2 and 3 to this report.
5. We have considered the Government's reply. We are pleased that NERC has recognised that its approach to funding systematics and taxonomy appeared

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<sup>1</sup> 5th Report (2007–08) (HL Paper 162).

<sup>2</sup> First Report (1991–92) *Systematic Biology Research* (HL Paper 22) and 3rd Report (2001–02) *What on Earth? The Threat to the Science Underpinning Conservation* (HL Paper 118).

to be unclear and that efforts have been made to remedy this (recommendation 7.19). We are disappointed that the Government continues to be unconvinced of the case for DIUS being designated the lead Government department for systematic biology (recommendation 7.26), and we remain confused as to why the Government did not consult the Scottish Government at the outset of its consideration of our report, instead of seeking the views of the Scottish Government only in response, it seems, to our letter to Mr Pearson in December 2008. We will continue to keep these matters and other matters arising from our report under review.

## APPENDIX 1: GOVERNMENT RESPONSE

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### Introduction

The Government welcomes the report of the Select Committee's Inquiry into Systematic Biology and Taxonomy. It is grateful for the thoughtful and comprehensive analysis provided by the Committee and for its recognition of the central importance of systematic biology to our understanding of the natural world. The Government fully agrees with the Committee that the Government, other interested bodies and the wider taxonomic community each have significant roles to play in maintaining and strengthening the discipline. This is particularly important given that, as the Committee rightly notes, major new opportunities and threats are developing. While the Government does not accept the arguments for a single Departmental lead for systematic biology, it will work to develop further coordination among parties for the future. This response sets out how it intends to do this.

This response has been coordinated by DIUS on behalf of Defra, DCMS, NHM, DCSF, DfID, NERC, BBSRC and Research Councils UK.

### Chapter 2: The role of systematic biology in the delivery of policies

**2.13 Measuring progress towards halting the decline in biodiversity is a key international obligation which cannot be achieved without baseline knowledge of biodiversity. Creating baselines and monitoring change is dependent upon the availability of taxonomic expertise across the range of living organisms.**

The Government agrees with the Committee about the important role of taxonomic expertise in the conservation of biological diversity, and the range of priority policy areas involving systematic biology. The creation and development of this baseline knowledge is critically dependent on our expertise and information resources.

The Government takes its international obligations to study and try to halt the decline in biodiversity very seriously. The leading government-funded systematic and taxonomy institutions in the UK, such as the Natural History Museum (NHM) and RBG Kew, are committed to developing their resources in these areas and to supporting national and international work on biodiversity.

The Government is working closely with key international institutions such as the United Nations Environment Programme, International Union for the Conservation of Nature and the World Conservation Monitoring Centre, all of who are undertaking significant work to raise the level of baseline data on biodiversity including building the capacity of developing countries to better monitor their own biodiversity.

**2.14 Systematic biology underpins our understanding of the natural world. A decline in taxonomy and systematics in the UK would directly and indirectly impact on the Government's ability to deliver across a wide range of policy goals.**

The Government agrees with the Committee's conclusion. Taxonomic and systematic expertise—utilised through integration with other research disciplines such as ecology and population dynamics—play a significant role in relation to many of our key research and policy goals; for example, the conservation of

biodiversity, ecosystem functions, combating pests and diseases, identifying alien invasive species, and monitoring climate change.

Defra has not identified any specific major impediments to delivering its priorities deriving from the spheres of systematics and taxonomy, but it recognises the concern to be able to maintain an appropriate level of taxonomic information and expertise in the longer-term.

### **Chapter 3: Health of the discipline in the UK: professional taxonomists, volunteers and recruitment**

#### **3.1 We recommend that a study should be commissioned by the Natural Environment Research Council (NERC) to ascertain the current number of taxonomists in the UK and also trends in the number of taxonomists in the UK.**

NERC agrees this recommendation and it will commission a study during 2009 drawing on information held by a range of bodies. In doing so, it will work closely with other major stakeholders and research funders including the Natural History Museum. The study will cover all three major elements of taxonomy identified in the report, identification, classification and phylogeny. It will also consider both classical and more modern approaches to taxonomy, including the molecular ones and those using internet resources. The study will cover the need for the outputs from taxonomy and taxonomic research as well as trends in the numbers of people involved in taxonomy. This will help determine the extent of any imbalance in supply and demand.

#### **3.21 The Committee believes that the major taxonomic institutions alone will not be able to meet demand for taxonomy. It is therefore, in our view, critically important that there should be more effective and regular dialogue between the users and the producers of taxonomy on the priorities for developing UK systematic biology. Such dialogue should be facilitated by the Research Councils.**

NERC agrees this recommendation. It will continue to facilitate dialogue between those with interests in taxonomic issues, including through studies of biodiversity and through the work of the National Biodiversity Network, with which NERC has been involved with since its early days. The *Living With Environmental Change* programme initiatives will provide opportunities for consideration of relevant topics, as will actions NERC is funding as part of the implementation of its new strategy (*Next Generation Science for Planet Earth*).

The Natural History Museum has agreed to use its expertise and venue to help convene, host and facilitate the proposed dialogue. The NHM can add particular value as a result of its international perspective.

#### **3.24 We welcome the Government's commitment to promoting voluntary action. The work of the volunteer community is crucial to the vitality of systematic biology. But the voluntary effort is patchy, tending against non-charismatic organisms and in favour of the charismatic. We urge the Government, with the assistance of the taxonomic institutions, to show more leadership in this matter and to take steps to promote voluntary action, giving particular attention to those sectors which cover the less charismatic species.**

The Government does not accept this recommendation. The Government recognises the importance of volunteers to communities, the economy and a wide

spectrum of sectors. The DCMS is currently preparing its Third Sector Strategy that will include coverage of volunteering. However, the responsibility to develop a strategy specifically for the area of systematics and taxonomy lies with the systematic and taxonomy sector itself.

The major taxonomic institutions have already taken the initiative in this area and actively promote voluntary action.

The NHM, for example, is supported by hundreds of volunteers in a number of roles, from scientific associates to interns to learning volunteers in the galleries. It actively supports and promotes a wide range of amateur citizen scientist/naturalist groups in partnership:

- It receives over 50,000 public enquiries a year about identification and specialist knowledge on the natural world.
- Its collections are used for study by over 8,000 visiting scientists each year, both academic specialists and informed amateurs.
- It supports specific naturalist groups, for example by hosting the annual riverfly fishermen conference.
- It encourages public monitoring and recording of biodiversity data through its popular online surveys, including those for bluebells and elm trees.
- It supports its staff in public engagement activities and encourages interaction with amateur naturalists.
- It is leading the international Darwin bicentenary celebrations with over 90 partners through the Darwin200 initiative.

The Museum is opening the Angela Marmont Centre for UK Biodiversity as part of the second phase of the Darwin Centre in September 2009, which will bring together the Museum's researchers and UK naturalists and highlight collaborative work with visiting UK researchers, wildlife groups and societies.

Along with Imperial College London and the Open University, the NHM is a key partner of the Big Lottery funded Open Air Laboratories Network (OPAL). The OPAL portfolio partners also include nine regional universities, Field Studies Council, Meteorological Office, National Biodiversity Network and Royal Parks.

OPAL wants to inspire communities to connect with nature and equip them with skills to explore study and protect the environment. The projects plan to work with people of all ages by providing training, practical experience, tools and support to record plants, animals and fungi in their local environments. The programme will aim to work with an estimated 500,000 people.

In addition, the Government fully supports the range of activities being developed by various organisations to support the bicentenary of Charles Darwin's birth and the 150th anniversary of the publication of the *Origin of Species* in 2009. This includes activities aimed at schools such as those funded by the Wellcome Trust (and conceived and co-ordinated by RBG Kew) which includes:

Primary schools—The Great Plant Hunt which invites school children aged 5–11 to explore the natural world around them in a series of activities, all clearly linked to the primary science curriculum. Every state primary school in the UK will be sent a Darwin Treasure Chest jam-packed with outstanding free resources. The fun activities—which take place in the classroom, online and in the great outdoors—include exploring habitats, collecting seeds and growing plants.

Secondary schools—a set of projects for 11–14 years olds, 14–16 years olds and 16–19 years olds all aimed at improving their understanding of the evolutionary process.

**3.25 In view of the Committee’s concern that demand for taxonomic skills will exceed supply, stimulating the recruitment of new researchers and new volunteers is vitally important.**

The Government agrees that there is a need to encourage more young people into science education and towards scientific careers in general. Government, its agencies and NDPBs are working to address this skills gap through a range of programmes.

For example, the NHM in particular, is actively addressing these issues by:

- encouraging young people to study science and view the field as an attractive career path through its learning programmes, especially through its DCMS/DCSF Strategic Commissioning funded Real World Science project for secondary science students,
- having an active volunteer programme,
- providing CPD for teachers,
- offering MSc courses in association with a number of leading universities, including Imperial College London,
- offering PhD supervision.

NERC is training a number of young researchers in taxonomic skills through studentships and research programmes. In the five years 2002 to 2006, 83 of the PhD studentships awarded by NERC included elements of systematics and taxonomy.

A further example is Kew. There is a long history of collaboration between cactus taxonomy professionals at RBG Kew and other institutions and a wide range of expert amateur enthusiasts. The International Cactaceae Systematics Group has produced 2 major published products: (i) the CITES Cactaceae Checklist (2 editions), which supports the implementation of the Convention on International Trade in Endangered Species; and (ii) the New Cactus Lexicon (2006), a not-for-profit 2 volume publication illustrating more than 95 per cent of the entire family (compiled and edited by staff at Kew and expert UK amateurs). The Lexicon, which has now become the standard reference work on this high profile plant family, was supported by significant input from both professionals and amateur volunteers—including in developing the most complete set of cactus images ever assembled (2,505 images largely donated by over amateur botanists and enthusiasts).

**3.28 In order to promote awareness of environmental sustainability as an over-arching issue, we consider that, as a matter of high priority, a greater component of biodiversity-related topics, including taxonomy, should be included school curricula. Field study trips and other practical exercises, which have served to introduce generations of children to the diversity of living organisms, should be encouraged as a means of engaging and stimulating young people (as future volunteers) to become involved in biological recording.**

The Government recognises the importance of field trips and learning opportunities outside the classroom in science education.

The revised secondary science curriculum covers the diversity of organisms (“all living things show variation, can be classified and are independent, interacting with each other and their environment”).

Field work is being encouraged in a number of ways:

- The new key stage 3 programme of study, being taught in schools from September 2008, says that pupils should experience science outside the school environment where possible.
- The Learning Outside the Classroom manifesto, launched in November 2006 aims to provide all young people with quality learning experiences outside the classroom covering the whole curriculum.
- The network of science learning centres provides several courses for teachers supporting biology fieldwork/science learning outside the classroom.
- Government sponsored bodies such as the NHM aim to provide high-quality out of classroom learning opportunities that support the new context-based secondary science curriculum, as well as providing informal learning opportunities through programmes like OPAL.

**3.29 We welcome the Government’s acknowledgement of the importance of the Renaissance in the Regions programme in providing additional resources for regional museums. At the same time, we urge the Government, through the appropriate funding agencies, to ensure continuity of funding to sustain curation, taxonomic work and outreach in the regional museums.**

DCMS welcomes the Committee’s recognition of the sustained investment going into regional museums through the Renaissance programme, as well as from local government and Higher Education Institutions.

**3.32 We recommend that steps should be taken, for example by the establishment of a periodic event, to foster personal networking between professional and voluntary taxonomists, the National Biodiversity Network (NBN), and other stakeholders.**

The Government agrees this recommendation. Defra will ensure that the appropriate networking events are established. The National Biodiversity Network (NBN) is a broad partnership of organisations working together to generate and share biodiversity records. The Natural History Museum is a member of the partnership and has various initiatives (principally through its Darwin Centre project) specifically aimed at improving links between the professional and amateur scientific community.

The National Schemes and Societies are also members of the NBN in its widest sense. They foster links between professional or expert amateur taxonomists and other amateur taxonomists (for example to validate records in difficult taxonomic groups).

Defra will work with the National Biodiversity Trust to identify opportunities for further networking, building on the work of the existing initiatives.

## **Chapter 4: Tools and technology for the twenty-first century**

**4.3 We have no doubt that the Internet will play a crucial role in the evolution of taxonomy and it is clear that further pilot studies in web-**

**based taxonomy involving a wider range of types of organisms should be undertaken urgently by the research community.**

The Government agrees this recommendation.

NERC is already making extensive use of internet resources in its biodiversity and genomics work. The tools and approaches are already helping those with an interest in the taxonomy and systematics of a wide range of organisms. Examples of existing work are provided in the Annex attached.

The NHM agrees with this statement and is currently reviewing its plans and investment in this area.

The Museum receives almost 15 million visits to its website every year, providing access to a far wider audience than it can physically reach. The NHM believes that providing information about its collections on its website is an important offer, which allows members of the public and scientists anywhere in the world to access the appropriate information they require.

The NHM is increasingly working more in the virtual world using web-based taxonomy tools, such as scratchpads and virtual laboratories for conducting science research on a European and wider scale, and providing access to collection information via databases online, such as the Biodiversity Heritage Library and the Encyclopaedia of Life. However, this is an area that will have high costs attached and needs to be put into an international context.

**4.4 We believe that a roadmap for the delivery of Internet-based taxonomy should be developed. Furthermore, we encourage the taxonomic community to come together to take the lead in its development since, in our view, it will only be effective if it emerges from the community. The process of developing this roadmap should be funded jointly by the Biotechnology and Biological Sciences Research Council and NERC as a high strategic priority.**

The Biotechnology and Biological Sciences Research Council and NERC agree this recommendation. They will work with NHM and DEFRA to facilitate the necessary interactions between representatives from the systematics and taxonomy community, and the information technology community. This will enable them to establish the technological requirements for internet-based taxonomy, taking particular note of developments in the international community and work already done by the Research Councils. They expect that development of a roadmap will be possible in the coming 12-18 months. See also 7.11 above.

**4.6 The Committee finds the rate of progress by the UK taxonomic institutions in digitising and making collections information available to be disappointingly low. Unless a more strategic view is taken of how they can contribute to the development of the field of biodiversity informatics, there is a significant risk of damage to the international reputation of major institutions such as the Natural History Museum.**

The Government recognises the Committee's concerns on this issue and Defra and DCMS have discussed it with the Institutions they sponsor. The NHM agrees with the Committee's comment. However, the Museum feels that a focussed approach to digitising collections is essential; it is currently mapping out its virtual masterplan for this area. The NHM is clear in making information a strategic priority and has a specific scientific information strategy. In the past five years it has successfully invested in a unified collections information system that represents a growing resource of digital data and images: this represents the highest

international standard for databases for collections of this size and complements similar systems developing in the US. The NHM has also implemented a programme of policy development and organisational change to ensure best use of new information systems. This will integrate currently available collections databases online with hitherto unavailable resources in coming months.

The NHM has a strategic commitment to innovation and leadership in information: to this end it is currently evaluating the potential of a biodiversity informatics centre to provide an innovation and research lead. NHM is organising a major international conference on biodiversity informatics in the summer of 2009.

The NHM has made a major commitment, with Kew, to European collaboration on collections and taxonomic information with funding from the EU for projects over the past ten years—these initiatives have served to provide harmonised approaches to collections information and to virtual resources for taxonomic research—such as those currently being developed as part of the European Distributed Institute of Taxonomy (EDIT). The NHM is leading in Europe on the Biodiversity Heritage Library, which is making all older biodiversity literature available through a single portal. The NHM has made a strategic commitment to both NBN and GBIF over a number of years, providing collections-related information to meet UK commitments under the CBD.

Accelerating digital access to collections is a key corporate objective for RBG Kew. Significant progress has been made and, although more work is needed to match the leading institutes in the provision of specimen data records, RBG Kew is now among the world leaders in the provision of high quality specimen images with accompanying specimen data. The bulk of RBG Kew's digitisation work has been resourced through targeted fundraising from external bodies and by capitalising on volunteer support. However, further progress with collections digitisation will depend on securing additional access to funding and support

**4.8 This Committee recommends that those UK taxonomic institutions with major biological collections should develop strategic plans for making biodiversity informatics more readily accessible to users through the Internet, and that the Department for International Development should fund selected digitisation projects that focus on the biodiversity conservation and sustainability needs of developing countries.**

The NHM accepts this recommendation. It is currently working on its strategic plans for this developing area. The Museum is organising a major international conference on biodiversity informatics in 2009.

A significant element of current strategic planning at RBG Kew is focused on growing its digital collections, making them more accessible to a range of different audiences through the Internet, and making sure they are sustainable in the long-term. This presents a significant challenge as these digital collections and biodiversity informatics resources scarcely existed 10 years ago and there are issues to do with funding in relation to these new demands which will affect the pace of implementation. Much of Kew's progress to date in this area has been with the support of US Foundations but further sources will need to be identified for the future.

The Department for International Development (DfID) does not accept the Committee's recommendation that it should fund selected digitisation projects.

Funding a standalone digitisation project would not be a funding priority for DFID, because it believes that this type of work should be part of a broader package of measures, including increasing the information base (where there are currently gaps), capacity building and support in accessing research and information as provided by, and supported through, the specialist agencies cited above, amongst others.

DFID is working with developing countries, through specialist agencies, and support to research, to support the implementation of Millennium Development Goal 7—Ensuring Environmental Sustainability.

DFID works with and supports key international environmental institutions including the Global Environment Facility (UK is the 4th largest donor), the United Nations Environment Programme (UK is the largest donor), (which in turn supports the World Conservation and Monitoring Centre—WCMC—in the provision of data and information on environmental conservation) and the International Union for the Conservation of Nature. All of these play a strong role in providing information, including, where appropriate, the digitisation of data and information to developing countries. It is also co-funding a major research programme with the National Environment Research Council (NERC)—Environmental Services for Poverty Alleviation.

**4.9 The Committee recognises that certain kinds of big research questions relating to large-scale biodiversity patterns in space and time can only be addressed using large-scale data. UK researchers addressing such questions should be able to apply for Research Council funding to create large scale aggregated datasets.**

UK researchers in universities can already apply for funds for this kind of work and are funded by NERC to do such work. UK researchers on these topics are also significant contributors to the work of relevant EU FP6 Integrated Programmes.

**4.12 The Committee is concerned about lack of co-ordination of barcoding effort nationally and about the potential for duplication of effort. The efficiency of barcoding as a diagnostic technique increases in proportion to the number of different species barcodes available for comparison. In the case of plant pathogenic fungi, we recommend that UK Biodiversity Research Advisory Group (UK BRAG) addresses the task of how best to co-ordinate barcoding effort across the UK.**

The UK Biodiversity Advisory Group (UK BRAG) will provide advice on how to co-ordinate the UK's barcoding effort on plant pathogenic fungi. This will depend on the active engagement of research and funding bodies. It should be emphasised that UKBRAG is not an executive body and has no budget. Consequently, the implementation of any advice is dependent on UKBRAG's member bodies.

**4.14 The Committee recommends that NERC supports research into developing an effective, functioning interface between rapid taxonomic techniques such as metagenomics and traditional morphological taxonomy.**

NERC agrees this recommendation. It already supports work of this kind through its support for its centres' long term environmental monitoring and survey. For example, the Scottish Association for Marine Science (SAMS) Culture Collection of Algae and Protozoa (CCAP) is conducting research in both these areas. The

value of a polyphasic approach, marrying traditional taxonomic methods and modern molecular biology, has helped CCAP in a number of case studies.

**4.22 In view of the continuing success of the NBN in accessing and serving data, and its importance in engaging with and empowering the large voluntary sector involved in biological recording nationally, the Committee urges Defra to assist the NBN in moving towards a less fragile funding model.**

Defra accepts this recommendation. Defra has a contract with the NBN Trust to develop the National Biodiversity Network (NBN) and increase data availability. The contract is worth £574,000 and runs from 2008 to 2011. Future funding will be reviewed towards the end of that period. The NBN Trust is a valued organisation which provides good value for money. The NBN is a large partnership and Defra is only one contributor. The breadth of the partnership is an important factor in empowering the NBN.

Local Record Centres (LRCs) are part of the wider National Biodiversity Network. Defra spent £181,000 in 2007–08 on a pilot Fund for Local Biodiversity Recording aimed at putting LRCs on a firmer financial footing by reviewing business practices and funding models in two pilot regions and implementing initial actions to improve efficiency and data availability. Defra is currently considering whether to roll out the Fund for Local Biodiversity Recording across England.

## **Chapter 5: Funding**

**5.6 The approach of NERC to funding taxonomy appears confused. We are very concerned that the mixed signals perceived within the taxonomic community are detrimental to the transparency which should characterise scientific discourse. We invite NERC to make a clear statement setting out its approach to the funding of taxonomy.**

NERC does not consider that its approach to the funding of taxonomy is confused. Its approach is summarised in the following paragraphs:

NERC recognises that taxonomy and systematics make an important contribution to environmental science, along with many other scientific approaches and disciplines.

### *Long term capability*

NERC's National Capability<sup>3</sup> activities in long term and large-scale work make use of a range of taxonomic skills and provide outputs relevant to science and policy through such activities as the Biological Records Centre and the Countryside Survey. The Centre for Ecology and Hydrology hosts a number of staff with taxonomic skills and are major contributors to (and, in some cases, run) internet-based information resources such as those run by the NERC Environmental Bioinformatics Data Centre and the National Biodiversity Network. Likewise, the British Antarctic Survey conducts work on the taxonomy and systematics of polar species and helps co-ordinate work on several taxa including fungi. Phylogenetic studies on protists (eukaryotes) are currently being carried out by Culture Collection of Algae and Protozoa (CCAP) managed by the Scottish Association of

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<sup>3</sup> National Capability is one of three major research funding streams in NERC—the others are Responsive Mode and Research Programmes.

Marine Science (SAMS). The phylogeny of marine bacteria is also being looked at by the Microbial and Molecular Biology (MMB) department at SAMS, in the context of related work on algal/bacterial interactions and novel compounds. NERC provides around £400k per year to the Sir Alister Hardy Foundation for Ocean Science (SAHFOS) continuous plankton record which is also supported by Defra. It is a world class observing system that is highly important in terms of science to policy. The work of SAHFOS is heavily dependent on the work of taxonomists.

### *Training*

NERC trains younger researchers in a wide range of skills by funding studentships and fellowships. A number of current grants and studentships support a varying proportion of taxonomic work

NERC has a responsibility to ensure its investments have a significant economic and societal value. It delivers this in part by supporting a number of Knowledge Exchange schemes. The taxonomy communities are eligible to apply to these as researchers or combinations of researchers and users; and they might make more use of these schemes than they appear to at present.

### *Research*

NERC provides funding for research involving taxonomy through all its funding modes, provided that the research in question meets the assessment criteria and funds are available.

Research proposals including classical taxonomic approaches may have the best chance of success if they take account of (a) the hypothesis testing science that typifies responsive mode grants, (b) the environmental monitoring and survey done within the national capability mode (which primarily takes place at NERC's wholly owned research centres) and, (c) polyphasic approaches, involving both classical and, say, molecular taxonomy.

**5.8 We recommend the establishment of a new process for commissioning the production of identification keys and field guides, involving joint actions between users setting priorities, funders supporting fixed-term appointments, host institutions providing access to collections and literature resources, and established series publishers producing the volumes. We also recommend that UK BRAG should explore the options for commissioning the production of new and updated identification guides for the UK fauna and flora.**

The Government understands that UK BRAG is prepared to consider options for the production of new and updated guides for the UK fauna and flora. This will depend on the active engagement of research and funding bodies.

**5.10 Whilst we understand that there are always many pressures on Government funds, we are concerned about the future of the CAB International (CABI) fungal reference collection given its significance to the stability of fungal systematics. Its loss would deepen the crisis in fungal taxonomy. We urge the Government to acknowledge this significance and to take steps to secure the CABI fungal reference collection into the future.**

Defra agrees with the Committee's views about the CABI fungal reference collection and recognises its global scientific significance. However, the issue of

substantial extra public funding is not straightforward, and Defra is grateful that the Committee recognises the range of funding pressures that exists.

Defra will provide a contribution of £250,000 in 2008–09 to support the costs involved in maintaining the CABI collection. Defra will also work with Kew and other interested government agencies to understand the specific funding requirements in greater detail and explore the options for securing additional financial support.

## **Chapter 6: Government awareness**

**6.8 The Committee received evidence of widespread concern from the user community about the health of systematic biology in the UK and concludes that the system for communicating this concern is not working. We find the lack of awareness, at Research Councils UK-level, of the state of UK systematic biology to be very worrying.**

RCUK does not accept that the communication system is not working or that there is a lack of awareness. For example, NERC recognised concern about taxonomy when consulting on and implementing its new strategy. The NERC community identified a need to examine further linkages between modern and classical approaches to taxonomy. The Environment Research Funders Forum (ERFF) skills review will be a source of relevant information on the state of such work.

**6.13 It is clear from the range of evidence we received that the perception that the Research Assessment Exercise (RAE) criteria do not favour systematics is still widespread in the UK biodiversity research community and that the RAE is still having a negative impact on the choices of career-minded scientists in taxonomy.**

**6.14 The Committee recommends that in developing the replacement mechanism for the RAE—the Research Excellence Framework—the Higher Education Funding Council for England should take into consideration the way that citation-based metrics disadvantage systematic biology and also the bias that would be introduced if grants-based metrics were employed, given that pure taxonomy is not deemed fundable by the Research Councils. It is essential that criteria appropriate to systematic biology research should be incorporated into the new mechanism.**

HEFCE notes this recommendation. The HEFCE grant for research is allocated to enable universities collectively to maintain a research base of world leading quality across the full range of disciplines, creating a sustainable and flexible national capacity which enables the sector to respond strategically to a changing external environment and on which research and other activity funded from other sources can build. This funding is allocated as a block grant which the receiving institutions may spend in ways that they consider will best meet these aims, and is not generally closely targeted at specified activities or fields of enquiry. Within this context, in developing the Research Excellence Framework the Council will pay particular attention to ensuring that excellence in all forms of research in all disciplines is appropriately recognised and rewarded. We shall consult widely on our proposals during 2009 and would welcome suggestions from subject communities for ways of ensuring that we capture the full diversity of research activity in their fields.

The NERC will fund research in taxonomy, such as that typified by polyphasic approaches, provided it competes successfully with other areas of environmental science.

**6.16 Given the baseline studies of the health of systematic biology already available in our reports published in 1992 and 2002, we recommend that the Environment Research Funders' Forum should seek to identify trends in the state of the discipline when making their review. We also recommend that the Forum should programme a follow-up assessment to take place within five years of their first review.**

ERFF is undertaking a skills needs review at present which will take place in three phases. It is currently in phase one; any skills needs in taxonomy and systematics will be highlighted during phase two which will include a major consultation on main skills needs in academia and the wider ES community.

The phase two report is scheduled for publication by December 2009.

**6.20 We recommend that there should be a lead Government department responsible for systematic biology and that further, because the central issue is the state of health of the discipline, we recommend that Department for Innovation, Universities and Skills should take on that role.**

The Government does not accept this recommendation. It is not uncommon for different aspects of a scientific field to be spread across more than one Department as in the case of systematics and taxonomy which is the responsibility of Defra, DIUS and DCMS. Indeed, a discipline may benefit from its interaction with a number of departments, all of which have an interest in its activities. The Government considers rather that it is through effective coordination among Departments that the discipline is best supported. There are dozens of individual academic areas, and it would be a major change in existing practice for the Government to identify a lead Department in relation to each one.

## Annex

### *Examples of NERC involvement in web based taxonomy*

NERC is already making extensive use of internet resources in the taxonomy and systematics of a wide range of organisms. Examples of existing work are listed in the following paragraphs, most of which were covered in the RCUK memorandum.

The British Antarctic Survey (BAS) has a searchable online database with over 2000 species represented, comprising predominantly mosses, liverworts and lichens with smaller collections of vascular plants, macro-algae and macro-fungi<sup>4</sup>. Data held by the Antarctic Environmental Data Centre at the BAS—some of which are relevant to taxonomy and systematics—can be accessed online<sup>5</sup>.

The Centre for Ecology and Hydrology (CEH) has developed the Environmental Information Data Centre (EIDC) which coordinates and consolidates environmental data management and information systems across CEH<sup>6</sup>. The primary objective of the EIDC is to provide researchers (both internal and external

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<sup>4</sup> [http://www.antarctica.ac.uk/bas\\_research/data/information\\_about\\_collections.php](http://www.antarctica.ac.uk/bas_research/data/information_about_collections.php)

<sup>5</sup> <http://www.antarctica.ac.uk/dms/terms.php?topic=+Biosphere+>

<sup>6</sup> [http://www.ceh.ac.uk/sci\\_programmes/env\\_info.html](http://www.ceh.ac.uk/sci_programmes/env_info.html)

to CEH) with access to the coordinated data resources and informatics tools required to deal with complex, multidisciplinary environmental questions which can involve taxonomy and systematics. Access to data sets is often via the internet.

Major data sets and facilities hosted co-ordinated by EIDC<sup>7</sup> include: The Biological Records Centre (BRC)<sup>8</sup> which amongst other activities produces and hosts web pages for recording schemes which lack the time or resources to produce their own<sup>9</sup>; the Environmental Change Network (ECN)<sup>10</sup> through which information on specific species distributions can be accessed<sup>11</sup>; the Countryside Survey which will make data from the 2007 survey available from its website<sup>12</sup>; the UK Butterfly Monitoring Scheme (UKBMS) which has a list of species recorded regularly in Britain and Ireland on its website<sup>13</sup> and digital data sets<sup>14</sup> available on request; the NERC Environmental Bioinformatics Centre (NEBC)<sup>15</sup>, that works to develop and implement solutions for NERC Environmental Genomics and Post-Genomics and Proteomics researchers including a variety of open-source projects; and CEH data dictionaries including coded lists of freshwater algae<sup>16</sup> and freshwater animals of the British Isles<sup>17</sup> are available online.

The Scottish Association of Marine Science (SAMS) manages NERC's Culture Collection of Algae and Protozoa (CCAP)<sup>18</sup> which has an internet site allowing users to search for strains, and provides advice on how to deposit new strains. CCAP is involved in a pioneering collaboration with the European Bioinformatics Institute (EBI) to provide 2-way direct hyperlinks between EBI-held sequence data with CCAP database strain records.

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<sup>7</sup> <http://www.ceh.ac.uk/data/DataSetsandFacilities.html#UKBMS>

<sup>8</sup> <http://www.brc.ac.uk/>

<sup>9</sup> <http://www.brc.ac.uk/hostedSchemes.htm>

<sup>10</sup> <http://www.ecn.ac.uk/>

<sup>11</sup> [http://www.ecn.ac.uk/request\\_form.asp](http://www.ecn.ac.uk/request_form.asp)

<sup>12</sup> [http://www.countrysidesurvey.org.uk/data\\_access.html](http://www.countrysidesurvey.org.uk/data_access.html)

<sup>13</sup> [http://www.ukbms.org/speciesLists/species\\_by\\_family.htm](http://www.ukbms.org/speciesLists/species_by_family.htm)

<sup>14</sup> [http://www.ukbms.org/speciesLists/species\\_by\\_family.htm](http://www.ukbms.org/speciesLists/species_by_family.htm)

<sup>15</sup> <http://nebc.nox.ac.uk/>

<sup>16</sup> [http://www.ceh.ac.uk/data/algae/algae\\_index.html](http://www.ceh.ac.uk/data/algae/algae_index.html)

<sup>17</sup> [http://www.ceh.ac.uk/data/furse\\_checklist/furse\\_animal\\_freshwater.html](http://www.ceh.ac.uk/data/furse_checklist/furse_animal_freshwater.html)

<sup>18</sup> <http://www.ccap.ac.uk/>

## **APPENDIX 2: LETTER TO MR IAN PEARSON MP, MINISTER OF STATE FOR SCIENCE AND INNOVATION, DIUS, FROM THE CLERK**

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At a meeting on Thursday 20 November, the House of Lords Science and Technology Committee considered the Government response to its recent report on systematics and taxonomy. The Committee has asked me to thank you for the response and also for your role in its co-ordination.

Whilst there were some aspects of the Government response which the Committee welcomed (for example, the provision of a financial contribution towards the costs of assimilating the CABI fungal reference collection at RBG, Kew), there were others about which the Committee has asked me to write to you for further explanation:

The Committee was disappointed by the Government's refusal to accept the recommendation (7.26) that the Department for Innovation, Universities and Skills should take responsibility as lead Government department for systematic biology. In para 6.18 of the Committee's report, the Committee gives evidence-based reasons for its recommendation. Although, as you say, it may not be uncommon for different aspects of a scientific field to be spread across departments, the Committee had taken the view that in this particular instance there were reasons why this diffuse approach was not working in the best interests of the health of the discipline. The Committee would welcome a more detailed consideration of its reasoning in para 6.18 and, further, given your reference to "effective coordination among departments" in your answer to recommendation 7.26, an account of the mechanisms by which this coordination is achieved and monitored.

With regard to the paragraph in the introduction to the Government response listing the departments and bodies on behalf of which DIUS was acting, the Committee would welcome an explanation as to why the Scottish Government was not also consulted given the importance of RBG, Edinburgh as one of the leading taxonomic institutions in the United Kingdom.

The Committee would welcome information about the governance of science within DIUS more generally.

The Committee was disappointed that, despite the evidence set out in paras 5.4 and 5.5 of the report, NERC was unwilling to accept the points raised concerning mixed signals and the willingness of NERC to fund classical taxonomy (recommendation 7.19).

The Committee looks forward to your reply to this letter early in the new year.

*15 December 2008*

## APPENDIX 3: GOVERNMENT REPLY

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### Recommendation 7.26

The Committee was disappointed by the Government's refusal to accept the recommendation (7.26) that the Department for Innovation, Universities and Skills should take responsibility as lead Government department for systematic biology. In para 6.18 of the Committee's report, the Committee gives evidence-based reasons for its recommendation. Although, as you say, it may not be uncommon for different aspects of a scientific field to be spread across departments, the Committee had taken the view that in this particular instance there were reasons why this diffuse approach was not working in the best interests of the health of the discipline. The Committee would welcome a more detailed consideration of its reasoning in para 6.18 and, further, given your reference to "effective coordination among departments" in your answer to recommendation 7.26, an account of the mechanisms by which this coordination is achieved and monitored.

### *Effective coordination among departments*

The Government disagrees that the evidence mentioned in the Committee report makes a sufficient case for changing existing arrangements for taxonomy and systematic biology, and in particular makes a strong case that lead responsibility for these subjects should be transferred to DIUS. It is for interested parties, whether Government Departments, Research Councils or taxonomic institutions, to identify the best mechanism or mechanisms for achieving coordination of their policy interests. A number of such coordinating bodies, such as the Environment Research Funders Forum and UK BRAG, already exist in the field of systematic biology and taxonomy, and have been described by the Committee in its report. These bodies provide ample opportunity for the public bodies with an interest in taxonomy and systematic biology to raise issues of concern for discussion with others. The Government considers that these bodies are the appropriate fora for addressing the issues raised by the Committee, and believes that transfer of lead responsibility to DIUS is therefore unnecessary.

### Introduction

With regard to the paragraph in the introduction to the Government response listing the departments and bodies on behalf of which DIUS was acting, the Committee would welcome an explanation as to why the Scottish Government was not also consulted given the importance of RBG, Edinburgh as one of the leading taxonomic institutions in the United Kingdom.

The Scottish Government has provided the following response:

The Scottish Government welcomes the 2008 House of Lords report on "Systematics & Taxonomy: Follow-up", and recognises that systematics and taxonomy are essential for environmental monitoring and understanding the ecosystem services which our environment provides.

We have good links with a number of UK systematics research funders through membership of the Environment Research Funders Forum, UK Biodiversity Research Advisory Group, the cross-research council Living With Environmental Change programme, Defra, BBSRC and NERC, and through sponsorship of the

Royal Botanic Garden Edinburgh, and will continue to work with them through these routes.

In the development of our next research strategy (2011–2016), we will continue to consider the role and importance of strategic systematic research and facilities as part of Scotland’s National Research Capability.

**The Committee would welcome information about the governance of science within DIUS more generally.**

DIUS provides funding for the research base through the Science and Research Budget, which is currently worth about £3.6 billion per annum, and through QR funding allocated by HEFCE currently worth £1.7 billion per annum. The bulk of the Science and Research Budget funding is allocated to the seven UK Research Councils, which determine their detailed scientific and research priorities in accordance with the Haldane Principle. The Rt Hon John Denham MP, Secretary of State for Innovation, Universities and Skills, restated his support for the Haldane Principle, in his speech at the Royal Academy of Engineering on 29<sup>th</sup> April 2008:

“For many years, the British Government has been guided by the Haldane Principle—that detailed decisions on how research money is spent are for the science community to make through the Research Councils.

Our basis for funding research is also enshrined in the Science and Technology Act of 1965, which gives the Secretary of State power to direct the Research Councils—and, in practice, respects the spirit of the Haldane Principle.

In practice, of course, Haldane has been interpreted to a greater or lesser extent over the years, not least when Ted Heath transferred a quarter of Research Council funding to Government Departments—a move undone by Margaret Thatcher.

But in the 21<sup>st</sup> century, I think three fundamental elements remain entirely valid.

That researchers are best placed to determine detailed priorities.

That the Government’s role is to set the over-arching strategy; and

That the Research Councils are “guardians of the independence of science”.

These should be the basis for Haldane today, and over the decades to come, and I am happy to re-state them.

But recent debates have thrown up questions about each of those principles. How researchers determine priorities? How ministers set strategy, and how Research Councils play their vital role.”

Given the strength of our research base, there are always more proposals for top class research than the nation can afford to fund. Decisions on which specific projects to fund are rightly taken by the Research Councils, using peer review, on behalf of the research community.

Ministers have an important role at a strategic level The UK’s world class research base requires major strategic and sustained investment to underpin it. For

example, without ministers' involvement, research would not have been supported on a sustainable basis through full economic costing.

### *1. Major facilities*

Major commitments like the UK Medical Research and Innovation Centre in Camden cannot get off the ground without active ministerial involvement across many Government Departments. The same is true of the international science and innovation centres being developed at Harwell and at Daresbury. Such commitments could be seen as constraining or pre-empting other parts of the research council programmes. But, in truth, if Britain is to be a big player in big science, major, strategic and sustained investment will always be needed.

### *2. Cross cutting responsibilities*

Whilst the Government's role is to set the overarching science and research strategy, the decisions on how research money is spent are for the research community to make through the Research Councils.

Some have raised questions as to whether the Research Councils are unduly constrained by their commitments to the four cross-council programmes—on lifelong health and wellbeing, energy, living with environmental change, and global threats to security. The country faces serious challenges and it is only right for the nation to look to research to help to solve them. All of these activities are taking place against the backdrop of a growing budget.

A proper focus on these challenges is essential and it must be right that Government is able to harness scientific expertise in dealing with them. That also forms a key part of our public case for research investment.

Hence the thematic programmes give a focus and cross-disciplinary emphasis to part of the Research Councils' budget. But, within these programmes, the majority of the work funded will of course be in response mode and here too, the scope, definition and allocation of funding is determined by the Research Councils.

### *3. Response to particular issues*

Occasionally cases arise where Ministers do rightly provide strategic direction, whilst still not becoming involved in individual decisions. When the Government accepted the scientific advice not to proceed with the fourth generation light sources, it raised questions about the future development of Daresbury—an important science and innovation priority. Therefore Sir Tom McKillop was asked to extend his work with the North West Development Agency, to advise on its future development. DIUS worked with STFC to ensure he has the scope to do so.

Similarly when it became clear how the STFC priorities might affect two areas of physics, the Secretary of State initiated a process that led to Professor Wakeham being asked to review the health of the discipline. The Wakeham review has been published and RCUK are working to implement the recommendations.

The allocation of the Science and Research Budget by DIUS, and the performance management of the Research Councils, is in accordance with this Principle.

The Government Office for Science is led by the Government Chief Scientific Adviser, Professor John Beddington. It exists to ensure that Government policy and decision-making is underpinned by robust scientific evidence and long-term

thinking. Professor Beddington reports to the Prime Minister and Cabinet and works with all Government departments.

### **Recommendation 7.19**

The Committee was disappointed that, despite the evidence set out in paras 5.4 and 5.5 of the report, NERC was unwilling to accept the points raised concerning mixed signals and the willingness of NERC to fund classical taxonomy (recommendation 7.19).

NERC accepts that prior to the publication of the House of Lords report, its approach to the funding of taxonomy and systematics may have appeared confused. We would like to thank the Committee for drawing our attention to this and giving us the opportunity to address the problem. We hope the statement NERC made in the Government Response clarifies our approach to funding taxonomy.

*11 February 2009*



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- 2nd Report Radioactive Waste Management Update: Government Response

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